SCIENCE.

FRIDAY, OCTOBER 10, 1884.

COMMENT AND CRITICISM.

THE ancient geographers drew their prime meridian through the Island of Ferro. They have been followed by the geographers of Germany and eastern Europe; while the French reckon their time from the meridian of Paris, and use that meridian in their maps; and the English, Americans, and Dutch recognize the meridian of Greenwich as that of zero longitude. With all these prime meridians, and others not so much used, there naturally arises considerable confusion in comparing maps made on the different systems; and especially is this the case in navigation, where the reduction from one system of meridians to another has to be made by men who little enjoy extra figuring. The idea of a universal prime meridian belongs to France; and as long ago as 1632, at the suggestion of Richelieu, Louis XIII. issued a decree recognizing that of Ferro. But later, to gratify the pride of Louis XIV., France returned to the meridian of Paris. That some meridian may be universally recognized as the zero meridian, an international conference on a common prime meridian was invited to meet in Washington.

The serious business of the conference was commenced last week Thursday by the discussion of a resolution presented by Mr. Rutherford, that the meridian of Greenwich should be recommended for the common use of all nations. So far as the views of the conferees were developed in the debate, it does not seem that serious opposition will be made to this proposal on the part of any nation but France. The French conferees have made a vigorous opposition to a decision in favor of any particular meridian, evidently desiring to keep the question open as long as possible. It is reported that they take this ground in pursuance of positive instructions from their government not to agree to the meridian of Greenwich. The conference adjourned on Thursday until Monday of this week, when the discussion was resumed. Commander Sampson of the U. S. naval observatory, Professor Rutherford, the author of the resolution, Professor Abbe of the U. S. signal-service, Professor Adams, and Lieut.-Gen. Strachey of Great Britain, favored the resolution, and Mr. Janssen of France opposed it. Mr. Janssen argued in favor of the adoption of what he called 'a neutral meridian.' He suggested that the international prime meridian should run either through Bering Strait or one of the Azores. Without action, the conference adjourned, subject to the call of the chairman. We can hardly share the view, which has found expression in the public prints, that the failure of France to accede to the decision will render the results of the conference nugatory. If all other nations adopt a common meridian, France will suffer much more by having one for her own exclusive use than any other nations will suffer by her action. The use of French maps, charts, books, etc., will be rendered inconvenient to others, and their circulation will thus be interfered with.

SIR WILLIAM THOMSON'S course of lectures at Johns Hopkins university has opened with every prospect of being a brilliant success. It would be difficult to find a case in which a lecturer on so abstruse a subject was greeted with so large and appreciative an audience as was collected in Baltimore to hear our distinguished visitor. It comprised not only the advanced students at the university, but professors from various parts of the country, including even the far north-west, who had left their stations to hear the latest thoughts of mathematical science on the subjects of the constitution of matter and the ethereal medium. The subject of the first part of the course is the undulatory theory of light, the

difficulties of which the lecturer did not attempt to conceal. It is, however, expected that the lectures will cover the ground of molecular physics in general, including the theory of vortex atoms, of which the lecturer himself, is, perhaps more than any one else, the originator.

At the last session of congress, provision was made for an electrical commission, to be appointed by the president, and seventy-five hundred dollars appropriated for the work of the commission. The commission was appointed, numbering among its members some of the best electricians of our country. It was generally expected that the commission would make some electrical experiments or tests pertaining to dynamos and secondary batteries. We believe such was the intention of the commission; but the Franklin institute of Philadelphia announced its determination to conduct experiments upon both these subjects, and the commission probably deem it inexpedient to make experiments in similar lines. We would suggest, that there are other subjects of as great or greater general public interest, upon which experiments might be advantageously made. We refer to underground wires and induction. These are interesting scientific questions, and of vital importance to both public and private interests. There are many patents for the laying of underground wires and for the prevention of induction. It is peculiarly proper that the merits of these different inventions should be investigated by a commission of scientific electricians, as a great difference of opinion exists between city corporations, and the telegraph, electric-light, and telephone companies, as to the use of such wires; the former requiring that all wires should be run underground, the latter contending that there is no means now known for the successful use of underground wires extending any considerable distance. The questions of induction and 'leakage' are also most important, as every one knows who has listened to a telephone connected with one of our large city exchanges.

Microscopical science has been completely revolutionized by a series of inventions, which have followed one another by such slow graduation, that the result is far more noticeable than the progress of the advance, — we see the change, but not the changing. Thirty years ago, there was little to do about a microscopical preparation. The object was placed under the microscope, and looked at. Of technique, little was known beyond squeezing the object between slide and cover-glass to make it thin, giving a dose of acetic acid, and mounting in Canada balsam. To-day a vast variety of methods are in use, the gradual accumulation of the experience and experiments of numerous workers. The most delicate and fugitive phases of organization can now be caught and fixed; the softest and the hardest materials can be made to yield sections of the extremest thinness and consequent transparency; dyes are skilfully used so that the pattern of colors shows the distribution of parts of different constitution, and that which it is desired to see is marked out from its surroundings. Perfected microtomes, working automatically and driven by mechanical power, are made to cut an entire object into sections as thin as two thousand or three thousand to an inch, and keep every section in its proper place in the series. Indeed, the present perfection of the art of preparing objects for microscopical examination was unlooked for, a generation ago. Nevertheless, the progress here has been equalled by that in the microscope itself: the cameras and illuminating apparatus, the application of the spectroscope, of photographic and measuring devices, and of the electric light, etc., have immensely increased the efficiency of the modern instrument. Yet there is another improvement greater than any of these, — the introduction of oil immersion objectives. Although the progress we have hinted at has been enormous, it still continues more rapid than ever, as the well-filled pages of the new microscopical journal, referred to in our notes this week, amply testify. Nothing is more remarkable than the rate of scientific progress to-day: men seem

in a fair way to be more amazed at their own intellectual production than at any thing that has yet happened in human history.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The Hall effect.

IN your account of the proceedings of the section of physics, at the Philadelphia meeting of the American association, occurs the passage: "He [Mr. Hall] used not only gold-leaf, but strips of steel, tinfoil, and other metals, and clamped them sometimes at both ends, sometimes in the middle, and sometimes only at one end; and in all cases the action was the same, with the same metal, irrespective of the clamping."

This statement is not accurate. I have subjected soft steel only to the test here described, and I did not with this metal try the experiment of clamping it at one end only.

Again, it is not quite accurate to say that Mr. Bidwell attributes the action under discussion, to "one edge [of the metal strip] being compressed and the other stretched." One can best understand Mr. Bidwell's explanation by examining the illustrations accompanying his article in the *Philosophical magazine* for April, 1884. E. H. HALL.

Cambridge, Sept. 20.

Iroquois pronouns.

Allow me to correct the entire misconception of my Montreal paper by your reporter of the anthropological section. I did not affirm that the "missionaries and all other authorities who have heretofore written on the Iroquois languages were mistaken," etc On the contrary, I proved that my conclusions concerning the existence of an *it*, and the non-existence of *on*, were correct by quoting the 'exceptions' and so-called 'idioms' resorted to by the French missionaries to sustain their adaptation of the language to the French form of two genders, etc. This adaptation, which simplified the study for the young priests, I affirmed would be folly for us to follow when writing upon Iroquois construction for English students. I proved my position by numerous examples from the best native authority, from those who understood English or French as well as myself. I might remark here that such authority presents a vast contrast to that which the pioneer missionary could obtain, and greatly facilitates investigation. I could refer your reporter to 'vocabularies' by long-resident missionaries which to-day are worthless from this fact. As to the 'English missionaries' referred to, I know of none who have contributed to Iroquois grammar.

I mentioned Rev. Ashur Wright, an American, as recognizing three genders; also Hon. Lewis Morgan, author of the 'League of the Iroquois.'

Upon so-called 'hazardous assertions' depends the march of science, and I venture to re-assert, '*it* still moves.' ERMINNIE A. SMITH.

Jersey City, Oct. 1.

Classification of Mollusca.

In Professor Gill's instructive comment on molluscan classification, he unintentionally misquotes me. The review in question said that no single instance of a calcified jaw 'occurs *to us*,' the two words in italics (omitted by Professor Gill) making all the difference between a positive assertion and a provisional one. The Nautilus, as Owen, Lankester, and others state, has been regarded as having a calcified jaw; and I am quite confident that it is the single instance known among recent mollusks. However, there is reason to believe that the expression of Owen was used in a less precise sense than has been supposed by later writers, and that the calcification, if actually present, is at most partial, and perhaps a mere individual trait. In the only specimen of Nautilus I have had the good fortune to be able to examine, the visible parts of the jaw were wholly free from any calcification. Whether the portions embedded in the muscular tissue, or otherwise hidden from view, may have been calcified, could not be determined, the specimen being held too precious to dissect. The composition of the jaw of Spirula is entirely like that of ordinary cuttles, as far as the eye could determine; and it is evidently desirable that we should have further investigation in regard to that of Nautilus.

In regard to the Acephala, it does not seem to me necessary that they should be ordinarily divided, unless good ordinal characters can be found; and, if the characters now used are imperfect, there is no reason for retaining the divisions founded on them, except in a provisional sense.

I fully agree with Professor Gill, that the present Dimyaria are not derived from the present Monomyaria; but whether both may not have had a monomyarian ancestor, it is still too early to decide, as it is (in a less degree) about the exact homologies of the shell glands in Chitons and ordinary gastropods, whose common characters seem to me largely adaptive.

It may be added, that while, so far as we know, Ovulum has a purely involute shell, Pedicularia, in its early stages, resembles a small Erato with a distinct spire. W. H. DALL.

U.S. national museum, Oct. 4.

The primitive Conocoryphean.

Your notice of Mr. G. F. Matthews's paper, read before the British association, though complimentary, gave no idea of the contents. Part of this communication was of exceptional importance. All accurate histories of the development of single animals are now thought well of; but Mr. Matthews has traced not only the transformations of the larval, but the characteristics of the adult period, and the transformations of old age. This author has also added the general history of the evolution of some of the most ancient groups of the trilobites, and shown that the changes they pass through correspond with the changes which the individuals of one of the groups, the Ctenocephalus Matthewsi, passed through during its growth. Opportunities for doing this sort of work are rare, and the men who do it still rarer.

ALPHEUS HYATT.

[It was impossible for us, in the brief space at command, in reporting promptly two scientific meetings of a week each in quick succession, to do justice to any paper. Many were altogether omitted. — ED.]

Book-postage in the United States.

In reference to your remarks on the expense of using libraries through the mails, allow me to point out that this expense is in America exactly double what it is, and has been for many years, in England, and even in Canada. The English and Canadian

rate of book-postage is one cent for four ounces: the American rate is one cent for two ounces. Surely there can be no good reason for such a restriction on the diffusion of literature in this country. Distant subscribers to circulating libraries and book-clubs in England are regularly supplied through the mails. Why cannot we have similar facilities here?

A. Melville Bell.

Washington, D.C.

Systematic earthquake observation.

It will give me pleasure to join in any such systematic effort to secure the observation of earthquakes as is proposed in *Science*, iv. 334, and to provide, so far as practicable, for establishing seismometers, and making observations at this observatory.

Edward C. Pickering.

Harvard college observatory,
Cambridge, Oct. 4.

Abnormal form of Trillium grandiflorum.

Early in June, 1883, I found at North Ferrisburg, Vt., a curious specimen of Trillium grandiflorum, — a species given to monstrosities, as every botanist knows. In this instance the petals were twenty-one in number, and pale green, edged with purple-pink, in color. I removed the plant to my garden; and in 1884 it displayed a blossom with eighteen petals and six sepals. The petals were deeper in color than before, and their general hue was pink rather than green. At neither time were there any traces of organs of fructification.

Henry Baldwin.

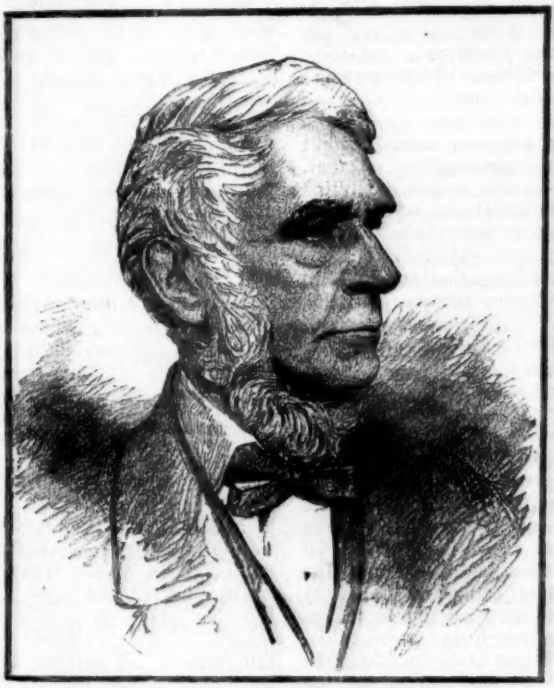
Charlotte, Vt., Oct. 3.

GEORGE BENTHAM.

George Bentham died at his house in London on the 10th of September, — a few days before the completion of his eighty-fourth year. The event is in the course of nature. His scientific life came to a close in the spring of the preceding year, when he laid down his pen upon the completion of the 'Genera plantarum.' His work finished, the wearied veteran succumbed to the bodily infirmities of age, yet still with mind essentially unimpaired, and has now gone to rest. His earliest publication bears the date of 1826, fifty-eight years ago. The first part of his classical monograph of the Labiatae was issued in 1832; and hardly a year of the subsequent half-century has passed without some botanical contribution from his hand. At the age of sixty, when most men seek retirement from service, he courageously entered upon his most formidable labors, — the 'Flora Australiensis,' in which he was assisted by Von Müller in Australia; and the 'Genera plantarum,' with Sir Joseph Hooker for his colleague, — and he lived to complete them both. Fortunately, he was able to devote all his time and powers to his favorite studies; and he steadily did so without distracting haste and without delaying intermission, for his short annual holidays were themselves usually made subservient to botanical investigation. Although he shunned official engagements and all time-consuming avocations, he did not refuse to bear his part of the burden in the administration of scientific affairs. When young, he was for ten years honorary secretary of the London horticultural society, with Lindley for under-secretary, in the most active and flourishing days of that institution. Later, he held for thirteen years the presidency of the Linnean society. In both situations he gave himself with characteristic thoroughness to his duties; he also brought to them a business tact, and a shrewdness of judgment and power of administration, which his very retiring habits would not lead one to expect. His annual addresses from the chair of the Linnean society, always pertinent to the time and the occasion, are models both in thought and in statement, and are of permanent value.

Mr. Bentham came of a notable stock. He was the nephew (and heir) of Jeremy Bentham; his father, Gen. Sir Samuel Bentham, was a naval engineer of remarkable talents; and his mother, if we mistake not, was a daughter of Dr. Fothergill. Some years of his boyhood were passed in Russia; the remainder of his youth in France, where his earliest botanical production was written and published. On his return to England he entered at Lincoln's Inn, and was admitted to the bar. About this time, to please his uncle, who had discerned his ability, he wrote a small and now very rare book upon logic, in which was first introduced the quantification of the predicate. But he soon returned to his early love, and devoted himself to phaenogamous systematic botany, in which, since his compeers, Brown, the elder Hooker, and Lindley have passed away, he has been *facile princeps*. His remarkable gift for languages, nearly every European tongue being at his command

was a great help: so, also, his independent but moderate fortune, free from family demands; for he was childless, and survived his wife. Of a philosophical temperament, and quite exempt from personal ambition, he might have been expected to take life easily; but *noblesse oblige* ruled his spirit, and he gave himself with unremitting and most disinterested devotion to his chosen line of work from boyhood to old age. He never seemed to select easy or congenial work, as he might have done, but rather took upon himself the harder tasks. Whatever he put his hand to was done faithfully; and, large as were his undertakings, he had the rare merit and good fortune of having completed all that he undertook. Hardly ever had a naturalist such a well-rounded life. Thirty years ago he gave to Kew his herbarium and library; and there, though living in London, he set up his study, in near association with his colleague and dearest friend, the director, in an apartment which will seem desolate enough now that he is gone. There he might be found at his work from ten to four o'clock during five or six days of every week 'with the regularity of a bank-clerk.' Neither biographical details nor an analysis of the work of Mr. Bentham are here attempted. These may be deferred to another occasion. But this simple tribute to a revered memory ought not to close without a word which may bring the reader nearer to the man. It might be thought that because Bentham was unusually reserved, and averse to popularity, he was of a cold and unsympathetic nature. It was not so. Rather, it was shyness, and a desire to save his time, that kept him aloof, and gave him an air of dryness. He was fond of the society of his intimate friends when the work of the day was over; and his attachments, if not numerous, were warm and true. All who really knew him will remember him as one of the most kindly, sweet-tempered, and generous-hearted of men.



George Bentham

The accompanying likeness, from one of the few photographs which were ever taken of him, represents Mr. Bentham at about the age of fourscore.

A. G.

EDUCATION AT THE INTERNATIONAL HEALTH EXHIBITION, LONDON.

As a member of the general committee of this exhibition, as well as of the chief educational jury thereat, the present writer has been requested by the conductors of *Science* to give some account of the educational exhibits on

view there (several of which will, at its closing, be despatched to the New Orleans exhibition); as well as of the international conference on education, — the first ever held, — which was opened on Monday, Aug. 4.

The present exhibition (called the 'Healtheries') is on the site of the 'Fisheries' of last year; but more than two acres of additional buildings have had to be constructed for it, and portions of the Royal Albert hall, as well as of the newly erected City and guilds of London institute, have been pressed into the service also, mainly to afford room for some of the educational exhibits. It is probably not too much to say, that no such elaborate and extensive collection of educational appliances, methods, and results has ever been brought together before; notwithstanding the fact, that, the primary object of the whole exhibition being to elucidate the conditions of health, it was considered expedient to attach to the principal display, mainly such objects and appliances as had a special relation to healthful school life. This limitation, however, has been interpreted somewhat liberally; and the result is a collection in which can be studied and compared the educational systems in primary, general, and technical education as practised in the British Islands, France, and Belgium, and to a less extent in Germany, Sweden, Switzerland, the United States, and Canada. At a meeting of the jurors held early in June, at which the Prince of Wales presided, the eminent surgeon Sir James Paget delivered an admirable address on 'National health and work,' in the course of which he estimated (as the result of carefully compiled statistics) that the annual loss to the English nation from sickness, four-fifths of which was preventable, amounted to the work that twenty million men would do in a week. He also pointed out the close relations between education and health, and closed with a very eloquent aspiration for the creation of a sound public opinion that physical health, just as intellectual superiority and martial prowess, was a thing to be striven after.

The exhibition itself has been a very great success; the attendance having been about one-third more than at the Fisheries, and averaging about one hundred and forty thousand visitors per week. The musical attractions have been great, as well as those of the illuminations of the grounds and buildings. The electric-lighting display is on a much larger scale than on any previous occasion, many thousands of incandescent and hundreds of arc lamps being employed; and the perfect steadiness of the latter exceeds any thing that has yet been seen. At the weekly Wednesday-evening *fêtes* the effects obtained by the illumination of fountains by electric lights in various ways (a prominent one being the total reflection of a beam of light within a jet of water, on the principle of the well-known lecture experiment) are exceptionally beautiful, and perhaps can best be compared to showers of various-colored gems.

The educational portion of the exhibition was opened by the Prince of Wales, about the middle of June; and its contents form the subject of a closely printed catalogue of several hundred pages, some of which are filled with admirable summaries and digests of the work accomplished by various educational organizations, — such, for example, as those of the ministers of public instruction in France and Belgium, both of which governments have organized elaborate collective exhibitions showing the methods and results of their primary and secondary education. Education in France has lately made most rapid advances; for the money which no previous government could obtain for popular education, the parliament of the third republic, definitely consolidated in 1877, has not feared to demand of the state, notwithstanding the pressure of taxes from the foreign and civil wars of 1870. In 1882–83 there were 5,432,151 pupils, and 129,657 teachers (of whom only 21,781 were uncertificated), in primary schools in France; and the general outlay of the state for primary education in that year amounted to very nearly $20,000,000. In March, 1882, laws were passed which rendered obligatory, 1°. the teaching of the elementary physical sciences in primary schools, 2°. the performance therein of a certain amount of manual work. Accordingly we find exhibited by the French minister of public instruction the authorized collections of objects and apparatus used in this teaching, as well as models of simple and cheap apparatus such as could be fabricated by the pupils themselves. The second law has called into existence the 'École normale de travail manuel,' a school probably unique, in which the whole instruction is gratuitous, admission being by competitive examination; and its course comprises the systematic teaching of carpentry, the use of the lathe, the chemical and physical laboratory, the smith's forge, and the engineer's shop. The handicraft work of pupils in many of the French primary schools, as well as in several technical schools, is very remarkable; while in the department of agricultural industry, the work of schools at Lille,

and also at Beauvais, is much to be commended and worthy of imitation. In the Belgian court, the systematic methods and good gradation of the school work are very remarkable; and very great prominence is given to the objective method of teaching in almost every subject. The technological and other school museums (notably that at Verviers) the contents of which are collected by the pupils, deserve especial notice, as also the whole apparatus for handicraft teaching.

The collective exhibit of the Institute of the brothers of the christian schools (which will be sent *en masse* to New Orleans) is one of the most remarkable and interesting in the whole Educational exhibition. Founded in Paris in 1680 by the venerable Dr. J. B. de la Salle, the institute has now nearly 12,000 brothers, distributed over 13 countries, directing 1,200 schools with an attendance of about 330,000 boys. Following everywhere the same general methods of teaching, they modify their details according to the requirements of the country in which they are; for example, in their United-States schools, every boy is taught, 1°. shorthand writing, 2°. the Morse alphabet, 3°. the use of the type-writer. The results of their teaching, as exhibited in 'sworn' performances of their pupils, in some instances excelled any thing known to the jury of experts who reported thereon. One of their specialties is their system of models, maps, etc., for teaching geography: they were the first hypsometrical maps published in French, or, for school use, in any language; and they are intended to give, by a suitable arrangement of colors, clear notions of the real configuration of the earth's surface. The objective and demonstrative methods of teaching are slowly finding their way into English schools, especially the 'board-schools' of Birmingham, Liverpool, Leeds, etc. But it may perhaps be permitted to the writer to say, as the result of a very close examination (extending over more than a week continuously) of the exhibits relating to primary education in various countries, that one important lesson to be learnt from the comparison of continental methods of instruction with English (and, so far as his knowledge extends, the same remark applies to America) is the great advantage afforded by that objective system, and by the adoption of that systematic order and method in all subjects of instruction, literary or otherwise, to which the name scientific, in the highest and best sense of the term, is applicable. This system is really a continuation of nature's method of instruction, and should be commenced in the earliest years. The late Dr. Whewell, in congratulating a friend, famous for his knowledge and ability, on the birth of a son, remarked, 'Young as he is, he will learn more than you in the next twelve months!' Accordingly we find in this exhibition, that the increased attention now being devoted to the whole subject of infant training, and the enlarged sympathy and interest with which the best modern teachers are studying the methods of Fröbel (some of the developments of which are at the basis of all so-called technical training), have justified the appropriation of a very considerable space to illustrations of the methods and results of the kindergarten system.

The limits at our disposal permit of no more than a reference to the appliances and results of technical schools, and of elementary art-instruction, nor to special methods and apparatus used in educating the blind and the deaf and dumb, nor to exhibits which illustrate such important subjects as every thing relating to the structural arrangements of school-buildings, school-kitchens, sanitaria, school-infirmaries, and lastly, though by no means least in importance, the gymnastic and other apparatus for physical training in schools. An allusion may be perhaps expected to the controversy now going on in England about overwork in schools. Probably the best answer to the alleged overwork is the fact, given on the authority of Sir Lyon Playfair, that, in the ten years succeeding the passing of the compulsory-education act, the health of children between five and fourteen years of age was thirty-three per cent better (as evidenced by the death-rate) than in the previous ten years; while the health of children under five years old only improved five per cent in the same period. Investigation has shown that almost every case of over-strain occurs in poor districts (both in town and country), where the children are underfed, a piece of bread being often their only midday meal.

It has been the aim of the writer, to draw attention to the growing recognition of the importance of objective methods of teaching. This may almost be said to have been the keynote of the International conference on education (Aug. 4 to 9 inclusive), which the president, Lord Reay, the rector of the University of St. Andrews, struck in his opening address. In a very able and scholarly discourse, he traversed a very wide educational area; but the point which drew forth the greatest applause was the expression, in regard to primary education, of his hope that the reign of the three R's (reading, (w)riting, and (a)rithmetic)

would speedily be replaced by that of the three D's, — drill, drawing, and (a)droitness. At the close, Mr. J. R. Lowell, the American minister, speaking as an ex-professor of Harvard, moved a vote of thanks; which was seconded (in French) by Mr. Buisson, director of primary education in France. Mr. Auguste Couvreur of Belgium supported the motion; thanking also Lord Carlingford and Mr. Mundella, the English government representatives of the education department, for their presence there that day. There were about fifty foreign delegates from twelve countries (including Japan and Brazil), attending this conference, the proceedings of which will be published in the course of the autumn. The conference, after being opened by Lord Reay, divided itself into four sections, which sat simultaneously from ten to one and from two to five for five days; and we conclude this article with a list of some of the more important subjects on which papers were read and discussed. 1°. The conditions of healthy education; 2°. Infant training and teaching; 3°. Technical teaching of all kinds (by Professor Woodward, St. Louis, U.S.A., among others); 4°. The methods of teaching the different branches of physical and natural science in elementary and other schools; 5°. The teaching of music; 6°. Museums, libraries, etc.; 7°. Training of teachers; 8°. Inspection and examination of schools; 9°. Organization of elementary education; 10°. Organization of intermediate and higher education; 11°. Organization of university education; 12°. On the teaching of agricultural science.

William Lant Carpenter.

RAILWAY-SIGNALS AT THE ELECTRICAL EXHIBITION.

Among the interesting features of the Electrical exhibition are the different systems of automatic electric railway-signals, designed to render collisions and wrecks impossible. One system, already in quite extensive use, is there illustrated in its application to the running of trains on the block system, on both single and double tracks, to the approaches of a crossing of two roads at the same grade, and to various combinations of switches and signals, whereby a signal cannot be set so as to 'clear' a train until the switch has first been turned in the proper direction, and by this very motion has automatically unlocked the signal-lever. If through any obstruction or failure in the connections the switch is not thrown clear over to its proper position, the automatic electric unlocking action will not respond, and the signal cannot be turned to let the train proceed. The application to a crossing of two roads at grade is very ingenious. The four approaches are guarded by switches, always left open when not in use; so that a runaway locomotive, or other destructive intruder, would be switched round upon a side curve, out of harm's way, as far as the crossing is concerned; and the signals are locked fast at 'danger' as long as these switches are open. Upon the approach of a train from any of the four directions, it announces itself in the signal-house while still at a considerable distance; and then, if the crossing is clear, and there is no previous announcement from either of the other three directions, the signal-man in his lookout-house turns a lever, which, by pneumatic action, closes the switch for the approaching train. This same lever-motion locks all the other switches open; so that the man could not, if he would, let any other train approach the crossing till this one had passed. If the switch closes safely, an automatic electric circuit unlocks the danger-signal lever for this one switch. The man then turns it, and then clears the track for the oncoming train, which can thus pass safely without stopping. If trains approach, meanwhile, from other directions, the danger-signals and open switches — which the signal-man himself cannot unlock till the train has passed the switch beyond the crossing, and automatically unlocked them — prevent any other train from getting to the crossing.

In running upon the block system, it is so arranged that a train entering upon each section, automatically closes there a green warning-signal and a red danger-signal for any following train. As it leaves the section, it automatically signals back, and opens the red danger-signal, but leaves the green warning-signal till it has left the next section, two blocks ahead. The action of a train, then, in leaving one section and entering on another, is to set the two signals there, and to signal back one block to open the red signal, and two blocks to open the green. The engineer of a following train, upon seeing a green signal, will know that a train is somewhere on the section next but one ahead of him, and will run cautiously; and if, upon reaching the next signal, he finds both the green and the red, he must stop till the train ahead has opened the red one. Upon a single-track road a similar set of signals is given, on the other side of the track, for two blocks ahead as well as behind the train. The automatic train-signals are all given through pairs of insulated rails, across which any pair of car-wheels will close an electric circuit; and they are so arranged, that, if the battery fails, the signal goes to danger through the action of gravity, and so remains till the trouble is remedied. This system depends principally, for safety, upon the watchfulness and certainty of the engineer in reading the signals correctly.

Another company exhibits a system which in some respects is superior to this in avoiding the danger from sleepy or inattentive engineers, or from the difficulty of reading the signals in stormy or foggy weather, and the trouble from batteries giving out or getting weak. Each locomotive carries its own battery in the shape of a dynamo, driven constantly by a small steam-en-

gine, whether the locomotive is at rest or running. One pole of the dynamo is connected to the locomotive, and the other to the tender, which is electrically insulated from the former except through this connection; and the circuit is normally completed through the rails on which the wheels of both are resting or running. In this circuit, within reach of the engineer, is a pair of coils whose armature is tightly held as long as the circuit is closed; but, when it is broken, the armature is drawn away, and opens the valve of a shrill whistle; and it stays away, though the circuit may close again and the whistle continues sounding, until the engineer reaches out and presses the armature up to the coils again, thus compelling his attention and voluntary action to stop the whistle. At any point or series of points in the line, where it is desired to signal to or from the approaching train, pairs of rails are inserted, electrically insulated from each other; so that, during the instant while the locomotive-wheels are on one pair and the tender-wheels on the other, the circuit will be broken and the alarm-whistle set going, unless these rails are otherwise connected.

They are thus connected by wires leading from the pairs of such rails ahead to any desired points, — to signal-stations, to switches, to drawbridges, to culverts, or bridges, or any part of the track or road-bed liable to be washed away or rendered dangerous. Thus, so long as the signal-man does not open this circuit, so long as the switch or drawbridge is not open, and the culvert, bridge, and road-bed are safe, the circuit keeps closed through these loops, the engineer gets no signal, and he runs on with confidence. But if any thing is wrong ahead, or if the man in the signal-tower wishes to signal the oncoming engineer, these loops will be open, the circuit will be broken, and the whistle set going till the engineer voluntarily stops it. Moreover, the instantaneous current sent from the dynamo over these loops when closed can signal the approach of a train, from as far as desired, to the signal-man at a crossing, to the train-despatcher, to the switch or bridge tender: in fact, to any points from one end of the line to the other the continuous flashes of this dynamo-current can be made a perfect tell-tale of the progress of the train. Moreover, these same currents can be made to lock switches and drawbridges ahead of the approaching train from pairs of rails preceding the danger-signal ones; and the engineer can thus confidently approach such places at full speed, knowing that no careless or confused switchman or bridge-tender or evil-disposed train-wrecker can have thrown these open after he has passed the locking signal-rails, and then, from another pair of rails beyond, the dynamo unlocks them after the train has passed. A signal on the throttle-valve lever warns the engineer if he attempts to run out of the round-house without starting up the dynamo, and any subsequent failure in the dynamo also, of course, blows the warning-whistle till it is set right. This system, in which each locomotive is its own unfailing battery, has certainly important advantages, especially in compelling the attention and voluntary action of the engineer whenever danger is ahead.

THE COMMITTEE REPORTS OF THE AMERICAN ASSOCIATION.

ALTHOUGH several committees were discharged last year for making no report, there were no less than eleven to be called on at the session on Monday morning. Of these, six made no response whatever: others, only a verbal and partial statement. The following reports are of general interest: —

Dr. E. B. Elliott of Washington, the chairman of the committee on the registration of births, deaths, and marriages, said that this committee was created many years ago to petition the United States congress for the establishment of a system of registration of births, deaths, and marriages. Since many states have established systems of registration of their own, the committee has petitioned, not for a separate system, but for the co-operation of the general government in securing uniformity and efficiency in the several state systems.

The first report of the committee on stellar magnitudes (Proc. Amer. assoc., xxx. p. 1) included a plan for the determination of standards for stars fainter than the tenth magnitude. Twenty-four bright equatorial stars were chosen; and the standards were to be selected from the regions following them from two to six minutes of time, and not differing in declination from the leading stars by more than five minutes of arc. The second report presented this year consists of charts of all the stars visible with the fifteen-inch telescope used at the Harvard college observatory, in all but three of the regions from which the standards are to be selected. These observations have been verified by the fifteen-inch telescope of the Washburn observatory. The report was referred to the publication committee.

The committee to confer with committees of foreign associations for the advancement of science, with reference to an international convention of scientific associations, reported that they had succeeded in conferring with a like committee from the British association.

A motion to have the committee discharged, as it had completed its task, having been made, Prof. H. Carvill Lewis of Philadelphia asked whether the committee might not continue to be efficient in extending courtesies from our own association to kindred foreign associations. Many gentlemen felt that some steps should be taken whereby members of our association going to England may become members of the British association while there, and a like courtesy be extended to members of the British association while in America. He therefore suggested that the action on the motion to discharge the committee be deferred for the present, in the expectation that arrangements would be made for the holding of joint meetings by the two great associations.

Mr. Trelawney Saunders of London, Eng., said he should like to respond in a few words to the kindly sentiments that had been expressed from the platform. As an Englishman, he said that he was delighted to hear the sentiment — a general sentiment, he thought, or it would not have been ex-

pressed here — which had been uttered. "You came from us," said Mr. Saunders: "If you return to us, you will meet a welcome which has in it as much warmth as that which you have accorded to us. Upon all occasions, whether they be international or inter-scientific, I assure you that the American people, particularly the English-speaking American people, will find a cordial greeting on the part of any Englishman to whom they appeal."

The chair announced that the motion to discharge the committee had been withdrawn.

The only other response to the call for reports was made by Professor Young of the committee in relation to duty on scientific books. He said that the committee had prepared, and, he believed, had presented to congress, a bill on the subject stated, which had failed to reach congressional attention.

THE BOTANICAL CLUB OF THE AMERICAN ASSOCIATION.

The meeting of the American association last year at Minneapolis attracted a larger attendance of botanists than usual. Without much consultation, a meeting of those interested in botany was called, a president and a secretary were chosen, and discussions, short communications, and papers upon botanical subjects, listened to. The Botanical club was thus inaugurated; and before the close of the session it was decided to do what was possible to secure a larger attendance of botanists at the next gathering in Philadelphia.

Although during the interim the prospect of a good attendance at the Philadelphia meeting had been fair, the most sanguine were surprised to find, that, as early as Monday preceding the opening, a number of botanists had arrived in the city; and by the following day a larger gathering could have been assembled than the total attendance at Minneapolis.

The first meeting of the club, of which several were held between Friday and Wednesday, was responded to by an attendance of about thirty, — a little below the average attendance for the subsequent meetings. Prof. W. J. Beal of Lansing, Mich., the president, took the chair; and Prof. J. C. Arthur of Geneva, N.Y., was appointed secretary to fill the vacancy caused by the absence of Professor Coulter. A paper by Dr. N. L. Britton of New York, on the composition and distribution of the flora of New Jersey, was read. The surface-features of the state were given, and the corresponding vegetation described. The work of cataloguing the plants is being done under the supervision of the State geological survey. The list at present has reached the very large total of nearly fifty-five hundred.

Prof. C. R. Barnes of La Fayette, Ind., spoke of the course of the fibro-vascular bundles in the leaf-branches of Pinus sylvestris. The two needle-leaves at the end of each short lateral axis contain each a paired bundle. The question at issue was whether this structure represented one or a pair of bundles, or whether it might not be a segment of the fibro-vascular ring of the stem. A study of the early stages shows that the first change in the stem is to divide the fibro-vascular ring into halves at right angles to the plane of the leaves; and subsequently these divide again, sending one branch of each to each leaf. The paper led to much discussion by Professors Buckhout, Macloskie, and others.

Dr. Bessey of Ames, Io., described the opening of the flowers of Desmodium sessilifolium. They expand partially in the usual manner, then remain stationary till a particular sensitive spot at the base of the vexillum is touched by an insect, when the wings and keel descend with a jerk, the stamens are released, and the insect dusted with pollen.

Professor Macloskie of Princeton, N.J., described the method of cross-fertilization of Geranium maculatum by bumblebees. Professor Dudley of Ithaca, N.Y., spoke of the torsion of stems of Eleocharis rostellata, and also on the protogynous character of some species of Myriophyllum. Mr. William H. Seaman of Washington, D.C., advocated the use of rather thick oblique sections in studying the structure of the fibro-vascular bundle, — a method that called forth a very strong protest.

Professor W. J. Beal gave a paper concerning the manner in which certain seeds bury themselves beneath the soil, which was discussed by Professors Bessey, Rothrock, and others. A paper by Prof. W. R. Lazenby of Columbus, O., on the prolificacy of certain weedy plants, embraced careful estimates of the average number of seeds produced by individual plants among various kinds of weeds. Dr. J. T. Rothrock of Philadelphia addressed the club on some phases of microscopic work, alluding particularly to micro-photography, its importance to the investigator, and the ease of execution.

Dr. Asa Gray called attention to the interesting discovery of Mr. Meehan regarding the mode of exposing the pollen in the common sunflower. He had found, that, contrary to the teachings of the text-books, the pistil and stamens develop together until reaching full length, when the filaments rapidly shorten, and the anther-tube is retracted, exposing the style covered with pollen, the further changes being the same as usually stated. This Mr. Meehan construed to be a device for self-fertilization; while Dr. Gray showed, that, although bees carried pollen from one flower to another of the same head, they also carried it from head to head, which constituted crossing in the fullest sense. An interesting discussion followed, in which Professor Beal suggested that an excellent experiment would be to cover up the heads, and ascertain if any fertile seeds were produced. Dr. Gray thought it very likely there would; for, when cross-fertilization is not effected, self-fertilization often takes place. Mrs. Wolcott had proved this to be so; for, in covering up the flowers to keep birds away, she found that plenty of seeds were formed.

Dr. George Vasey of Washington gave some notes on the vegetation of the arid plains; which was followed by observations on the curvature of stems of conifers, by Dr. Bessey, in which he noted the bending of stems one, two, and even three years old.

Mr. Thomas Meehan discussed the relationship of Helianthus annuus and H. lenticularis; showing that there was a constant difference in the form of the corollas, the former being campanulate, and the latter tubular. The two are treated as one species in Gray's 'Synoptic flora of North America;' the one being considered a cultivated form of the other, — a view from which the speaker dissented. Mr. Meehan then spoke upon the fertilization of composites; concluding that the arrangements were such as to favor self-fertilization, which is opposed to the generally accepted view.

Prof. L. M. Underwood of Syracuse, N.Y., gave some statistics concerning the North-American Hepaticae. Of the two hundred and thirty-one species found north of Mexico, a hundred and twenty are peculiar to America: fully one-half the latter are not represented in any public or private herbarium in this country.

In a paper on the nature of gumming, or gummosis, in fruit-trees, Prof. J. C. Arthur detailed experiments from which the conclusion had been reached, that it was due to a de-organization of the cell-walls of the tree through the influence of some fungus, but not necessarily of a specific one. It had been produced experimentally by the bacteria of pear-blight and by Monilia fructigenum, the fruit-rot fungus; although the most common cause is doubtless the Coryneum, first described by Oudemans in Hedwigia.

At the final meeting the committee on postal matters then gave its report. This committee was appointed at Minneapolis to inquire into the various obstructions which the postal authorities throw in the way of exchanging specimens of dried plants. The efforts of the committee had been directed toward securing the passage of specimens bearing the customary written label at fourth-class rates of postage. The decision of the postmaster-general was read, stating that the present law could not be construed to permit the passage of specimens with written labels except at letter-rates, but expressing a willingness to bring the matter, at the proper time, to the attention of congress, the Canadian authorities, and the congress of the Universal postal union. Some discussion followed; and a motion was carried to continue the committee, and also instructing the president and secretary of the club to draft resolutions to be presented to the section of biology in order to still further promote the objects in view. These resolutions were acted upon by the biological section on the following day. Dr. Bessey was chosen president, and Professor Arthur secretary, for the next year.

Besides the reading of papers, the club took several excursions. On Saturday they went to the pine-barrens of New Jersey, about fifty participating. On Monday a party visited the ballast-grounds during the morning, and upon their return inspected the library and herbarium of Mr. I. C. Martindale of Camden, N.J. In the evening of the same day the Botanical section of the Philadelphia academy of sciences entertained the club, the Torrey botanical club of New-York City, and other invited guests, at the rooms of the academy. About three hundred were present, and a thoroughly enjoyable time experienced. On the afternoon of Tuesday the club and its friends, in all about eighty, made an excursion to the Bartram gardens, one of the most interesting historical spots to botanists in this country; and the club then adjourned.

In reviewing the attendance of botanists at Philadelphia, and the work of the Botanical club, there is much reason for congratulation. About a hundred entered their names on the register of the club as botanists, or about eight per cent of the total attendance, one-half of whom are widely known for their attainments in the science. There was no lack of interesting papers and free discussion. Besides the important measures already referred to, the club was instrumental in securing the appointment of a permanent committee of the Association to encourage researches on the health and diseases of plants. But, above all, the augmented facilities for intercourse and acquaintanceship, and the impulse imparted to individual workers, through the influence of the club, are a sufficient *raison d'être*, and a promise of usefulness for the future.

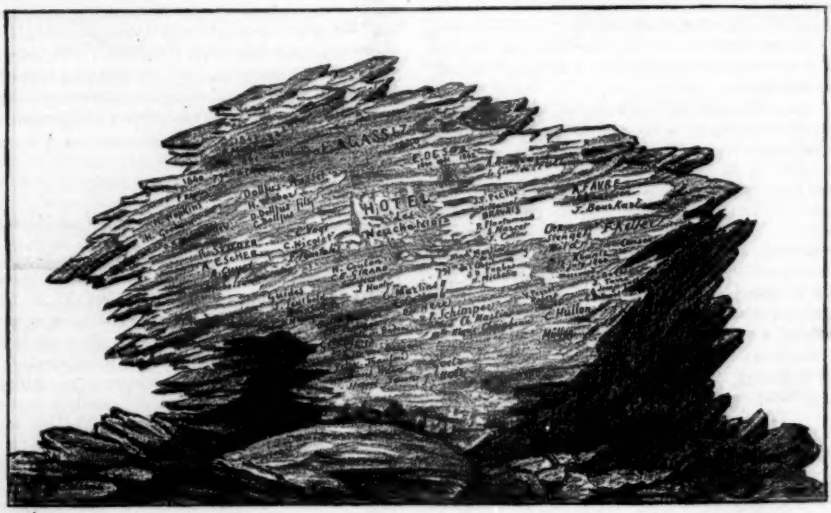
PSYCHICAL RESEARCH IN AMERICA.

A MEETING was held in Boston, on Sept. 23, to consider the advisability of forming an American society for psychical research. Prof. W. F. Barrett, vice-president of the English society, was present, and gave an account of the work they are doing in England in the investigation of 'mind-reading' and the so-called spiritualistic phenomena, which last they always find to fail when the medium is securely bound. As one good result of the English society's work, it was stated that there had been a decrease in the activity of the society of spiritualists in London. It was the sense of the meeting, that if any thing could be done in this country to check the growth of the belief in the supernatural powers of 'mediums,' and to show what is the true explanation of such phenomena as 'mind-reading' and mesmerism, it would be a work which should enlist the assistance of American scientific men. Professor Barrett showed, that, in the case of 'mind-reading,' most of the results pointed to an unconscious guidance on the part of the person whose mind was being read, but there were residual cases he would not so explain. It was the opinion of those present, that the collecting of the stories of fulfilled dreams and anxieties would be fruitless, but that there were many questions of a physiological nature which should be investigated, and no longer be allowed to go unanswered or ignored. A committee was appointed to consider the whole matter of the formation of a society, or in what way it may seem best to undertake the work; and, at a meeting held last week, steps were taken for the formation of a society in America, of which we hope soon to report the complete organization.

THE HÔTEL DES NEUCHÂTELOIS, AND WHAT BECAME OF IT.

At a recent *fête* of the Swiss Alpine club, a despatch was received from Mr. Forel in regard to the names which he has found on the Aar glacier. Mr. Forel gave to the *Gazette de Lausanne* the following information on the subject. He recalled the scientific zeal of Agassiz and his friends in Neuchâtel, and their studies, extending from 1840 to 1846, of the glacier near Grimsel. These enthusiastic naturalists stationed themselves at the very centre of the glacier at the junction of its sources, — the Lauteraar and the Finsteraar, at the foot of the rocky promontory known as the Abschwung. They found on the middle moraine a block of micaceous schist, supported by other rocks, and forming a natural shelter, which they completed by other dry walls of rocks. They thus possessed a rustic cabin, which they named the Hôtel des Neuchâtelois; and there they lived three seasons, illustrious in the annals of science. From 1840 to 1843 the Hôtel was the rendezvous of all interested in the theory of glaciers. But unfortunately the block began to break up. As early as 1841 there were numerous fissures; and in 1844 it was broken into two pieces; since then, the frost has divided it into a thousand pieces. It is this *débris*, still of considerable size, which Mr. Forel has found. The highest block still bears inscriptions in red lead, unfortunately most of them illegible. He could only decipher the date '1842,' written three times, and the name 'Vogt' (at present professor at Geneva). Twenty-five metres lower, toward the valley, is the stone discovered by Mr. Ritter of Leipzig, which bears the inscription in large capitals, still easily read, "Stengell (engineer, pupil of Osterwald), 1844; Otz (engineer at Neuchâtel), 1845; Ch. Martins (professor at Montpellier);" and several illegible letters. This block also bears the inscription 'No. 2;' for in 1842, Agassiz had a number of remarkable rocks marked with numbers, the arrangement of which he intrusted to his friend Wild, the geodesist of the expedition. The block of the Hôtel was marked as No. 2. The third block is fifty-five metres lower, and bears the inscriptions, 'Solioz Auguste 1842,' 'Lieutenant Guntren,' and several words which Mr. Forel did not understand. Mr. Forel calls attention to the fact that the course traversed by the blocks since the determination of their position by Agassiz has been about fifty-five metres a year.

We add an illustration of the rock as it appeared in 1840–42, reduced from a plate in Dollfus's *Matériaux pour l'étude des glaciers.*



THE INHABITANTS OF THE PUNJAB.

Outlines of Punjáb ethnography: being extracts from the Punjáb census of 1881, treating of religion, language, and caste. By Denzil Charles Jelf Ibbetson, of her Majesty's Bengal civil service. Calcutta, *Government*, 1883. 4°.

This is an imperial quarto of about 375 pages, made up of portions of the census report, as indicated in the title, using no less than eight enumerations of pages in combining the stereotype plates selected. There is a good table of contents, but no general index.

The Punjáb has irregular boundaries; but it may be roughly indicated as that part of Hindostan north of the parallel of Delhi (near 28° latitude, and 78° longitude), and west of a line drawn north-west from that city,

which it includes. Kashmir, controlled by England, is not included in the report.

The Punjáb, with its feudatory states, covers an area of 142,449 square miles, with a population of 22,712,120. One-fourth of the Musalmán, one-twentieth of the Hindu, and eleven-twelfths of the Sikh subjects of England, and one-eleventh of the total population of the Indian empire, are in the Punjáb. This region was in the path of all the early migrations and expeditions into the Indian peninsula, and presents a fruitful field for the students of history, of languages, and of sociology.

Here are found the primitive forms of religion and of social customs, in near proximity to recent growths and modifications, while the intermediate steps are well represented. The early growth of property in land is well illustrated in the western part, while village communities are represented as typically perfect in the eastern part.

Abstract 1 includes the rainfall by tracts; and in notes appended, the general condition of the people, and the liability to famine, are indicated. The rainfall ranges from a minimum of an inch in the thinly populated western grazing-plains, to a maximum of a hundred and twenty-six inches in the Himalayan tract, where the moisture of the winds is precipitated by the mountains. A portion of the plains east of the meridian of Lahore (near 74°) yields good crops without irrigation, but is liable to disastrous failures that do not befall irrigated lands. It is the granary of the Punjáb, and has flourishing trade and manufactures.

Mr. Ibbetson says that all books with which he is acquainted

"fail utterly and entirely in conveying to the reader the faintest idea of the religions which they describe, as actually practised by their million followers in the villages of the country. The books on Hinduism, for instance, describe Hinduism as it ought to be, Hinduism as it was, perhaps Hinduism as it now is among the Pandits and educated Bráhmans of the holy cities; but they do not describe Hinduism as it is in the daily life of the great mass of the population."

Recognizing his own knowledge as defective, he aims to point out where the esoteric doctrines may be found described for the various faiths in their purity, and, with these as a basis, to show how little they appear in the daily belief and practice of the Punjáb peasant, and to indicate what that belief and that practice are.

The Musalmáns are about one-half of the population; the Hindus, about three-sevenths; the Sikhs, about one-thirteenth; Jains, 42,678; Christians, 33,699; Buddhists, 3,251; and others in small numbers. The classifications of religions are unsatisfactory, in part from the unwillingness of the better part of those who profess a religion to acknowledge as of their creed the degraded classes who profess it, and partly from the difficulty of defining Hinduism in particular. No one is a Sikh by birth. Professed Christians, Jains, and Buddhists have a measurably defined position. Mahometanism approximates distinctiveness, but Hinduism is confusing. It is regarded as the outcome and expression of the character of its followers, rather than as an element influencing that character. In this census the Hindu was regarded as the normal faith of those not otherwise classified.

"Socially, the characteristic of the Hindu is quiet, contented thrift." The Sikhs are more independent, brave, and manly than the Hindus. The Punjáb villager, converted to Mahometanism, is invariably filled with false pride and conceit, and tends to become extravagant, unthrifty, and discontented.

There are few large towns in the Punjáb, and any attempt to identify the subdivisions by reference to a general map would be unsatisfactory.

Caste is very fully treated, and will be noticed at another time.

Brahmanism is given as the distinguishing feature of Hinduism, which early degenerated from a religion into a "sacerdotalism with Brahmans as its Levites, the vitality of which is preserved by the social institution of caste, and which may include all shades and diversities of religion native to India as distinct from the foreign importations of Christianity and Islám, and from the later outgrowths of Buddhism, . . . Sikhism, . . . and Jainism." The dead are worshipped. Superstitious observances are general. On the western frontier, Hindus are lax in ceremonial and caste observances. Hindu sects are innumerable, and liable to be returned as religions.

Sikhism is given as founded by Bába Nanák A.D. 1469–1539. Nanák did not attack the teachings of others, but added something higher, teaching that salvation came through repentance and a pure and righteous life. During his life, gentleness was predominant among his followers; but some of his successors becoming involved in politics, a Mahometan persecution arose against them, and a spirit of revenge was roused, emphasizing a martial spirit, especially under a guru, or leader, known as Govind Singh, A.D. 1675–1708. Among the formalities of the Sikhs was a baptismal

initiation, and a communion with consecrated cakes of sugar, flour, and butter; while caste distinctions were positively condemned.

It is only an exaggeration to say, that 'the language changes every ten miles:' but two-thirds of the people speak some form of Punjábi; one-fifth, some form of Hindi; one eleventh, Sindhi.

Abstract 63 shows that from 1875 to 1880, inclusive, fifty-six hundred and ten books were published in the Punjáb, only two hundred and twenty-seven of which were in English. This suggests what an extensive literature is yet to be brought to the knowledge of western scholars. An incidental reference indicates that Punjáb pupils learn the multiplication table to one hundred times one hundred.

The migrations and changes by which present conditions have been reached are treated in considerable detail.

This volume is a part of the record of the second effort to gain a complete census of the British dependencies throughout the world, — the first, indeed, which approximated full success. Its treatment of ethnic religions and social facts adds greatly to the available material for western sociologists. Mr. Ibbetson thinks the whole of the types of primitive superstitions in Tylor's 'Primitive culture,' so laboriously gathered from forgotten records, could be illustrated in current customs of Punjáb villages. In the omitted chapters there seems to have been an abstract of the population of all India, not easily restored by one on this side of the globe from diverse provincial reports. Abstract 45 gives the number of those in each ten thousand of the people professing each leading religion for each province of India, and other abstracts give kindred ratios to which one is desirous to add particulars. No summary shows the number of castes, nor are marriage statistics given. While superstitions are detailed for days under English names, we look in vain for a hint of the origin of the Indian Sunday. The complete report would make good some lack in this volume. The text, however, was prepared under great pressure for time, and there is a mass of material in official hands not utilized. There is such an amount of new information furnished, that defects of indexing or of arrangement are secondary, even when the printer sets a couple of pages wrong side up, and arranges tables so that one must often turn the book up side down to read sub-titles. There is, unfortunately, no uniformity in the spelling of oriental words by English officials. Among peculiar spellings here are Quran (the sacred book of Islám), Musalmán, Mughal or Mongol, Shekh, and Faqir.

GEOLOGICAL AND NATURAL-HISTORY SURVEY OF CANADA.

Reports of progress for 1880-82. Alfred R. C. Selwyn, director. Montreal, *Dawson*, 1883. About 200 p., 12 pl., 9 maps. 8°.

This volume is one of the reports of progress of the Canada survey. Like all such preliminary reports of survey work, it is of a varied and somewhat scrappy nature. A report of progress must, in order to justify its name, have some of the valuable, if not diverting, qualities of a log-book.

There is no record of any final or definitely finished work in this account of varied and important labors. This absence of completed work in any part of the vast field of study before the survey will be apt to increase the friction which it now encounters. There is much to say in favor of the reconnoissance system, when a survey is charged with the exploration of such an imperial wilderness as the Dominion of Canada. Special considerations may, and often will, determine the elaborate study of particular districts; but the principal work should be, at least for years, the rapid study of the *areal* geology of the country, including the outlines of its commercial problems. This reconnoissance work seems fairly well carried on by the Canada survey. The reports lack the beauty of finish of the United-States publications; still, they represent the labor of devoted men, who are wrestling with bad food, swamps, and black flies for the most of their days in the field.

The first forty-five pages of this volume are occupied by the general report of the director. We note in it, that the notorious weather-prophet, Mr. Venner, who for many years was employed by the geological survey, had severed his connection with it. There is a good deal of tedious, and little valuable, detail in this synopsis of the survey work. Next we have a brief account of the system of geological nomenclature and map-coloring used by the survey. The system of coloring is convenient and sufficiently graphic; in the nomenclature, the author feels the need of the division Cambro-Silurian, a term that is now pretty well fixed in the science. The third paper, also by the director of the survey, is entitled 'Notes on the geology of the south-eastern portion of the Province of Quebec.' This interesting region contains the gold-bearing

gravels of the Chaudiere valley, which are among the few profitable placer grounds of eastern America. Although but a cursory examination, this study suggests many interesting points for future inquiry. Appended to this report are some notes on the microscopic structure of certain rocks of the Quebec group, by Mr. F. D. Adams. They seem to be careful studies; but, there being no figures of the sections from which the microscopic researches were made, they suggest little comment.

The first of the assistants' reports is that of Dr. G. M. Dawson, on the geology of the Bow and Belly river region, north-west territory. It contains a very interesting account of the coals of the Laramie epoch, which are of exceeding value to the north-western region. Although in its nature a preliminary report, it contains a large amount of valuable detailed information concerning these coals. Although essentially lignites, they are superior to the most of such deposits now in use in Europe. This report is illustrated by several rather coarse lithographs, showing interesting aspects of this district.

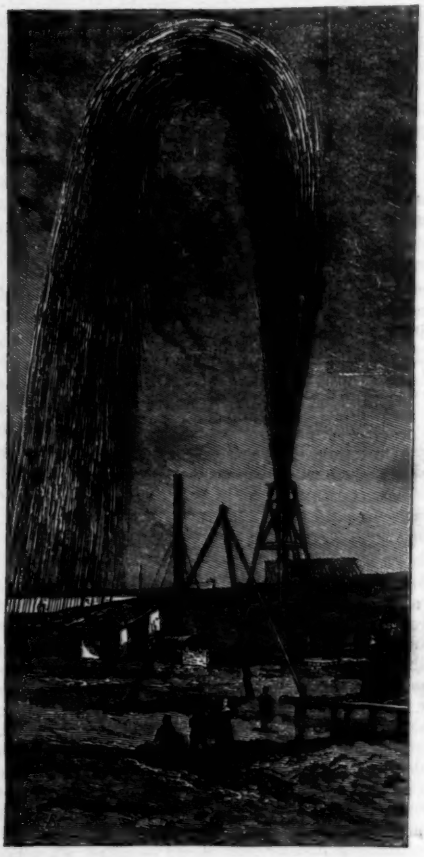
The next report is one by Dr. Robert Dell, on the geology of the basin of Moose River and Lake of the Woods, with two heliotypes of scenery, and two maps. This report is of a very preliminary nature. In its nine pages of text, only enough is given to show that the region is full of interesting problems. The accompanying maps show the general distribution of the Laurentian and Huronian rocks, but the information is only a matter of outlines. It has, however, a special economic interest, as it indicates a possibly new gold-field, and, what is perhaps of more importance, a prospect of extensive apatite deposits in this district. Appended to the report is a catalogue of plants and of coleopterous insects, the latter by the late Dr. LeConte. Next there are two considerable reports by Mr. R. W. Ellis, on the geology of northern and eastern New Brunswick, and the north side of the Bay of Chaleurs, and on the geology of the Gaspé peninsula. Both these reports concern very interesting regions, which have previously been described in a general way. In them a great many contributions are given to the general structural, as well as the economical geology, of these districts. There are interesting lists of fossils from the several members of the paleozoic series. We miss the detailed sections which are obtainable in this country, which would have greatly added to the value of the report.

Next there is a report on some of the mines of the Province of Quebec, by Charles W. Willemott. Except the apatite mines of the Gatineau district, these deposits do not seem to have much value. For the apatite deposit, there seems to be a large future. Accounts of the several mines are extremely brief, and have not much economic or scientific value. The volume ends with a report of Mr. G. Christian Hoffman, entitled "Chemical contributions to the geological survey of Canada, from the laboratory of the survey." It consists of about fifty determinations of various substances of presumed economic or scientific interest, with various remarks as to their value in the arts, only one of them of general interest; viz., a careful analysis of the mineral smarskite, newly found in Canada. This branch of the work of the survey has been put out of gear by the removal of the laboratory from Montreal to Ottawa. As a whole, these reports, covering as they do the work of three years, are rather disappointing. The survey has an annual grant of sixty thousand dollars. Much is to be allowed for the difficulties arising from the size and complications of the field with which it deals; still, it seems as if more in the way of definite economic and scientific results should be attained with this liberal expenditure.

NOTES AND NEWS.

We take the following 'editorial note' from the September number of the *American meteorological journal* as suggesting a simple plan of work in which many non-professional observers might contribute a willing share toward the solution of important problems: "Is it not worth while to consider whether the deficiency of observations on local storms, which makes the determination of their action doubtful, could not be remedied by appointing special days on which hourly or bi-hourly observations should be taken, with additional records at still more frequent intervals when any change in the condition of the air required it? These special days might be on certain pre-arranged dates, 'term days,' so called, when the records would gather up any thing that happened to come along in the passage of the weather; but they would better serve the purpose here in view if they were really specially appointed by the signal-service officers only a day or two before their date. It is evident enough from an inspection of Finley's maps, and from a brief study of summer thunder-storms, that the southern side or south-eastern quadrant of our passing cyclones contains the greatest share of local disturbances. Let the plan be published in advance by circulars and newspaper paragraphs; and then, if, while a cyclone was still beyond the Rocky Moun-

tains, the day of its arrival over the upper lakes could be foretold, there might be thirty to sixty hours telegraphic notice given of the appointment of such a day for special observation over the whole region east of the Mississippi. The notice should properly take a somewhat striking form, so as to excite an interest in the attempt among persons who would ordinarily let the weather-changes pass by unnoticed; the news-



papers and railroads could be in nearly all cases counted upon to aid in spreading the news of the appointment; and even if the general records gave only the direction and estimated force of the winds, and beginning and ending of rainfall, two or three special days of observation in June or July might produce a wonderful fund of material for study."

— Among the recently discovered petroleum-wells at Bakou, Russia, was one which for four or five days after opening threw a stream of oil into the air to a height of forty feet. The natives were so impressed that they built a temple especially for the veneration of the well. The wiser speculator has expended his energies in building a railroad from Bakou to Batoum on the Black Sea, and contemplates the construction of a canal fifty miles long, by which a river of oil may flow from the Caspian to the Black Sea. We reproduce from *Science et nature* an illustration showing the fountain of oil, copied from a photograph.

— Lieut. Stoney, U.S.N., commanding the U.S. exploring schooner Ounalaska, has been heard from under date of July 6, when he had reached latitude 66° 4′ north, and longitude 168° 15′ west. Upon leaving St. Michaels, Lieut. Stoney stood north along the American coast until June 27, when ice was encountered fifteen miles to the northward of Sledge Island, in latitude 64° 22′ north, longitude 166° 23′ west. After several unsuccessful attempts to penetrate the ice, which proved to be very heavy at this point, the Ounalaska was headed to the southward until clear water was reached, when the ice to the westward was skirted just to the north of St. Lawrence Islands, and St. Lawrence Bay was reached June 30. Learning that Kotzebue Sound was closed, Lieut. Stoney anchored, and waited for the ice to commence moving, and, after a four-days' gale from the south, he ran over and anchored under East Cape, where he remained, to take advantage of the first opening of Hotham Inlet, when the exploration of Putnam River would be continued.

— The Italian papers announce what appears to be an important discovery just made in Sicily. Petroleum has been 'struck' in the province of Palermo. A grotto in the flank of a mountain was pierced, and in twenty-four hours seventy pints were collected. The crude oil is said to be of very high quality, and is so limpid that it may be used with little or no refinement. The borings are being pushed forward very rapidly, and their results are looked forward to with no little interest. Hitherto, we believe, Italy has produced no mineral oil; and if, as seems likely, the new springs should prove productive on a large scale, the kingdom will possess an entirely new and important source of wealth. It should be added, that the present discovery is the result of a number of repeated but hitherto unsuccessful searches after petroleum.

— It has been announced at the hygienic congress held in August at the Hague, that the prize of two thousand francs, offered by the London society for the prevention of blindness, is awarded to Professor Ernest Fochs of Liége. The next hygienic congress will be held in Vienna.

— An interesting collection of antiquities from Cyprus is now on view in London. It includes beautiful specimens of ancient glass, some remains of pottery, a bronze mirror with a piece of the original cloth it was wrapped in, and some ancient armor. There are also some silk and cotton fabrics, such as are still made at Cyprus, some of which are both cheap and pretty. They are made on the simple hand-looms which are still used by the Cypriotes as in days of old.

—Dr. Ferd. Löwl, of the German university at Prag, has just completed a valuable *résumé* of observations and theories on the making of valleys (Ueber thalbildung, Dominicus, Prag, 1884, 136 p., with many cuts), that should prove of special value to American students of physical geology and geography. It will serve well as a guide to the German literature on the subject. The contrast is well brought out between the older theory that referred the beginning of valleys to splits and cracks in the earth's crust, and the newer that regards them as chiefly independent of these guides; and numerous examples are mentioned to show, that valleys are not only formed in unbroken rocks, but also, that, where the rocks are greatly faulted, the valleys run almost independent of the fault-lines. The origin of cross-valleys, on which the author had written previously (*Science*, i. 325), is again discussed, and carried to a conclusion adverse to that reached by Powell, Tietze, and Medlicott. The views of Rütimeyer and Stein, as to the revelation of old base-levels in the terraced slopes of Alpine valleys, are disputed chiefly because direct elevatory movement, by which the base-level is changed, is not any longer to be admitted in modern geology; and the cañons of the Colorado are referred chiefly to climatic conditions. While we cannot accept these conclusions, the book deserves careful study.

— The recent visit of Dr. C. V. Riley to Europe, on a mission from the Agricultural department, is noticed in a recent number of *Nature*, which says that during his two months' sojourn in Europe he has twice been on the continent, and has visited correspondents and acquaintances both there and in England, examining the insect collections in various museums, and especially at South Kensington. He speaks favorably of the lasting influence for good which the International forestry exhibition at Edinburgh will have, and of the Serrel serigraph, —an American invention, which has of late years been perfected in Lyons, and which he thinks is destined to revolutionize silk-reeling and profoundly influence silk-culture, which is just now attracting unusual attention in America. He was also much interested with the investigations into the life-habits of the Aphididae that are being carried on by Jules Lichtenstein at Montpellier, and with the thoroughness with which the French authorities encourage experimental research in advanced agriculture. He received a warm welcome at Montpellier, whither he went at the invitation of the French minister of agriculture to explain some new methods of dealing with the Phylloxera, and where he found his own recommendations of previous years so fully carried out. He was also surprised at the very extensive and successful experiments with American vines carried on at Pageset, near Nîmes. At a meeting of the Société d'agriculture d'Hérault, held on June 30, he read a paper entitled "Quelques mots sur les insecticides aux États-Unis, et proposition d'un nouveau remède," which appears in full, with an account of the discussion, etc., in *Le Messager agricole* for July 10, 1884. The 'new' remedy is kerosene emulsion, which has been successfully used, especially against Coccidae, in the United States. Its application against the Phylloxera is recommended in much the same manner as is used with regard to sulpho-carbonate of potassium. The proportions recommended are three hundred or four hundred grams of the emulsion in forty litres of water.

— A new feature in the German market is Caucasian petroleum. The first sixteen wagon-loads of petroleum by the Marienburg-Mlawbraer railway recently crossed the German frontier, and sixty more are to follow. The German-Russian naphtha-import company has acquired land on the frontier at Illowo, and here three reservoirs holding seventy-five wagon-loads each are set up; from these reservoirs the petroleum is to be pumped by steam-power into the German wagons.

— The mineral wealth of the Weser hills is becoming more clearly recognized in Germany. Ironstone beds have recently been found in several places, which seem to be connected and to form one long vein.

— Efforts to cultivate the tea-plant are now being made in several parts of Europe. In France, on the lower Loire, the plants have been extensively set; but it is still a question whether the leaves will retain their characteristic aroma on a foreign soil. In Sicily the plants set three years ago at Messina are strong and healthy, and have flourished in leaf and seed. Russia has also made the attempt, the first planting being at ten versts from Aleschbri on the Dnieper, and proving satisfactory; and plants have also been sent from Odessa to Suchum. In Germany the Silesian committee of agriculture have received seed and directions from Profe-sor Göppert of Breslau, with a recommendation to attempt their cultivation.

— The second part of the *Zeitschrift für wissenschaftliche mikroskopie*, etc., confirms our favorable opinion formed by the examination of the first number of the new journal, and we think the publication will soon become indispensable to active workers with the microscope. Microscopy is no longer the simple undertaking of a few years ago, but an art, manifold and elaborate in both its principles and its methods. Indeed, no one can be in the front rank of discovery in those fields where the microscope is the essential instrument of investigation, unless acquainted with the most recent advances of microscopical technique. The new Zeitschrift will be valuable, because it is to be the central repertorium for gathering and rendering accessible the improvements of the microscopist's art. We praise the periodical in question, because it does well what it undertakes to do.

We have to notice also another new journal, the *Recueil zoologique suisse*, comprising, according to title-page, "l'embryologie, l'anatomie et l'histologie comparées, la physiologie, l'éthnologie, la classification des animaux vivant ou fossiles." It is edited by Dr. Hermann Fol, with the collaboration of a number of his compatriots. It appears in parts of from a hundred to a hundred and fifty pages each, at irregular intervals. Four will form a volume of five or six hundred pages, with from twenty to twenty-five plates, in octavo. It is expected that the volumes will

be annual. The journal is published by H. Georg at Geneva. The price of the first volume has been fixed at twenty-five francs, but will be raised to forty francs as soon as completed. Three parts of the first volume have already appeared, and show by the character of their contents that the Recueil ranks from the start with the best of the zoölogical journals. Part third contains papers by Schiff on lymphatic hearts, Fol on a human embryo of 5.6 millimetres, Keller on Medusae, Sabatier on the cells of the follicle of tunicates, Flesch on a parasite of the horse, and Bedot on the central organ of Velleia. The plates and the typography are both excellent.

— Dr. C. C. Parry is now in England, examining the methods used in the care of European herbaria, and studying his favorite genera of plants as represented in the botanical storehouse at Kew.

— The hitherto rare shells, Helix facta and Binneia notabilis, have recently been found abundant on the volcanic island of Guadaloupe, off the Lower Californian coast, by G. W. Dunn. The curious Binneia, with a body much larger than its shell, envelops itself in aestivating in a case of material similar to the hibernacula of other land shells. The fauna and flora of this isolated island are largely southern Californian, rather than Mexican. Its beautiful cypress has been found near San Diego, its pine is Californian, while its palm is of a peculiar Lower Californian genus that extends to near the United-States boundary.

— The piece of the Calais-Dover cable shown by Mr. Crampton at the meeting of section D of the American association (see p. 324) was part of the cable laid thirty years ago, but was cut from the cable in 1859.

— Botanical collectors are active this season in developing the flora of unexplored portions of the south-west; paying especial attention to the rich fields of Arizona, New Mexico, and Sonora in old Mexico. The dry, desert fields of 1883 have been blossoming like the rose, and offering them unexcelled facilities.

— Baron Nordenskiöld has prepared for publication a volume containing all the results of his arctic work up to the present time; and an English translation of it will probably be published in the course of the present year. The rumor has been revived in the English papers, that his next important enterprise will be an expedition to the south pole; and it is certain that the question of the feasibility of such an exploit has been brought under his notice. Dr. Oscar Dickson has, however, informed his scientific friends in London, that he will have nothing to do with an antarctic expedition; but they are of opinion that he may reconsider his determination.

— A work on Lapland and the Lapps, similar in character to Mr. du Chaillu's 'Land of the midnight sun,' has been prepared by Dr. Trombolt, a Swedish *savant*, who some time ago visited that region to watch the aurora borealis. Dr. Trombolt lived in the closest intimacy with the Lapps; and the results of his observations, scientific and social, are about to be given both to the Swedish and to the English public, a translation of the work having been prepared by a Swedish gentleman resident in England, who is familiar with English.

— The French northern railway company has begun experiments on motive-power generated by electricity, at the Chapelle station. The company has established an electric lift with two Siemens electromagnetic machines; one for elevating the weight, and the other for moving the machinery alongside the railway.

— Mr. G. F. Harrington, J. P., of Ryde, Isle of Wight, has tried a method of sewer-ventilation, by means of shafts placed at intervals of about five hundred feet, which are connected with the sewers, and carried up the sides of the adjoining houses. While one shaft conducts air into the sewer, the other carries it away. The in-draught shaft is surmounted by a cowl, which is so designed as to have its face constantly presented to the wind, and through this a stream of air is said to be always passing into the sewer; the return-shaft being open at a good height.

— Unfavorable reports have been received of the expedition of the Italian traveller Bianchi. He intended to work a direct way from Abyssinia to the Red Sea; but on reaching Mehalfé at the end of March he was deserted by his escort, and obliged to return. After re-organizing his caravan he reached Danakil-land on April 30, and has since been reported as stopped between Lale and Zula by want of water; but the Italian government has received contradictions of this report from Aden and Assab.

— Dr. Richardson's experiments for the painless extinction of animal life have been brought to a successful termination. The electric shock did not prove sufficiently safe, so Dr. Richardson sought for an anaesthetic agent which would make death rapid as well as painless. He successively experimented with nitrous and carbonic oxides, ether, chloroform, coal-gas combined with chloroform, all of which more or less fulfilled their end. The results have been very satisfactory, as carried out at the London home for lost dogs, where a chamber was charged with carbonic oxide, the gas having been previously passed over a porous surface, from which it took up vapor containing chloroform. Into this chamber was introduced a cage containing the dogs, which in a very short time passed from life to death in a profound sleep, without evincing the slightest pain or consciousness. Dr. Richardson has also administered the same narcotizing agent to sheep, so as to allow of their being killed in a perfectly painless manner; and he hopes that before long there will not be an abattoir in England without facilities for employing the system.

— The Society of the red cross has instituted some experiments with the electric light as an aid in the search for wounded on the field. An exhibition of the experiment was made during the recent meeting of the society at Geneva, but proved a disappointment to the spectators on account of the full moon which was shining at the time.